Emissions Reduction Analysis for Proposed Rules R307-315 and R307-316; NOx Emission Limits for Natural Gas-Fired Boilers, Steam Generators, and Process Heaters; 2.0-5.0 MMBtu and greater than 5.0 MMBtu

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Summary:
To estimate current NOx emissions from boilers in the Northern Wasatch Front Nonattainment Area (NWF NAA) and potential emissions reductions, UDAQ staff followed the calculation methodology found on page B-5 of APPENDIX B. To determine the number of units in the NWF NAA, staff used the Utah Labor Commission's publicly available Utah Active Boilers data set[1]. Staff imported the data into RStudio to find boilers in the four NWF NAA counties (Davis, Salt Lake, Tooele, and Weber) that operate on natural gas. Staff separated these units into 2-5 MMBtu and greater than 5 MMBtu capacity groupings using column V "Boiler_Capacity." There are two boiler capacity units of measurement in column W, "Capacity_Measure," LBSHR and BTUS. To standardize the units of measure, UDAQ staff followed the Utah Labor Commission's advice to multiply LBSHR by 1000 to convert to BTUS. Following this conversion, the 2-5 MMBtu grouping had 1,614 units, and the greater than 5 grouping had 519 units. UDAQ did not follow the step in APPENDIX B of grouping the units by SIC codes as it did not impact the emission reduction calculations.

Current Emissions:
UDAQ added total boiler capacities for each rule grouping and assumed the units operate at 75% of their maximum rated heat input. For the 2-5 MMBtu grouping, UDAQ assigned the AP-42 NOx emissions factor from Table 1.4-1 for Small Boilers (<100 MMBtu/hr Heat Input) Uncontrolled. This emission factor is 100 lb/MMscf, which AP-42 advises in footnote a to convert to lb/MMBtu by dividing by 1,020. This conversion rounds to 0.1 lb/MMBtu. For the greater than 5 MMBtu grouping, UDAQ assumed the emission rate of 30 ppm NOx since at least a third of these boilers are already permitted. UDAQ multiplied lbs/MMBtu by 833 to find ppm NOx. Therefore 30 ppm NOx converts back to 0.04 lbs/MMBtu for emissions reduction calculation purposes.

Incorporating the above assumptions, UDAQ multiplied total boiler capacities by 75%, lbs/MMBtu, and 24 hours a day, then divided by 2000 to convert to tons per day.

NOx tons/day = (boiler capacity MMBtu/hr * 75% operating capacity * lbs NOx/MMBtu * 24 hr/day) / 2000 lbs/ton

UDAQ estimates the current NOx emissions are 4.2 tons per day for 2-5 MMBtu and 4.3 tons per day for greater than 5 MMBtu.

Emissions Reductions:
Proposed rules R307-315 and R307-316 require a NOx limit of 9 ppm or 0.01 lb/MMBtu. UDAQ used the same calculation for the new lbs/MMBtu and estimated new emissions could be 0.5 tons per day for 2-5 MMBtu and 1.9 tons per day for greater than 5 MMBtu. Therefore, UDAQ estimates total NOx emissions reductions of 3.8 tons per day for 2-5 MMBtu and 3.1 tons per day for greater than 5 MMBtu.

NOx emission reductions = Current NOx emissions - New NOx Emissions

[1] https://laborcommission.utah.gov/divisions/boiler-elevator-and-coal-mine-safety/boilerandelevator/